

SPECIFICATION

Touch Sensor

Field of the Invention

The present invention relates to a touch sensor aiming to correct an error of process dimension due to abrasion of an edge tool by setting a reference position for checking the machining position while the cutting edge of the edge tool such as a bite and drill in an automated computer-controlled machine tool such as a machining center and a jig drilling machine advances. More specifically, the invention relates to a construction of a mechanism that enables it to detect a minute displacement (in microns or sub-microns) with a minute measuring pressure.

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Background Art

In recent years, IC integration level has increased dramatically. This requires further minute precision hole processing, for example, accurately depth-processing 2 - 4 layers out of 5 - 6 layers of printed boards in the order of micro-meter, using a drill made of an ultra-hard material such as diamond having a diameter in the order of 0.1 mm or less. The revolution speed of the drill reaches hundreds of thousands per minute, causing abrasion to occur at the cutting edge. Therefore, the edge position must be checked regularly, e.g. every one hundred times of hole processing, in order to keep the relative position between the working table and the cutting edge constant.

A touch sensor is used as a checking apparatus for keeping the cutting edge stable with respect to a reference position provided as a predetermined height from the surface of the working table of the aforementioned machine tool. It is provided with a mechanical means for switching an electric contact from ON state to OFF state by a snap action of, e. g. toggle mechanism, when a free end of a lever-type actuator rotatably supported by a hinge is pressed against an edge tool, and its movement is transferred to a sliding pin. Alternatively, it may be provided with an optical means wherein the reference position of the edge is detected with a signal output at which the edge directly blocks the light beam, to correct the fluctuation due to the abrasion at the edge.

However, a contact load for activating a touch sensor having a mechanical means requires e.g. 100 to 300 gf as an energizing force in order to counteract resistance by anti-action accompanied with a snap action of a contact by moving the actuator lever. Accordingly, without such a contact pressure, a setting of a reference position with accuracy and stable reproducibility is not obtained. On one hand, processing a